ORDER U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

6950.23B

3/1/01

SUBJ: . CABLE LOOP COMMUNICATION SYSTEMS AT AIRPORT FACILITIES

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1. **PURPOSE.** This order establishes the program, planning, and implementation guidelines for upgrading communication systems that support the National Airspace System (NAS) at major airports. Communication systems are herein defined to include discrete control/monitor, digital data, voice/voice frequency, and radar video/trigger signals.

2. **DISTRIBUTION.** This order is distributed to division level in Airway Facilities, Air Traffic, Flight Standards, and to the Offices of System Architecture and Investment Analysis, Airport Planning and Programming, and Airport Safety and Standards in Washington; to division level in Air Traffic Control Engineering and Test, Communication Navigation and Surveillance Engineering and Test, Facilities Management, and Aviation Simulation and Human Factors at the Technical Center; to the Logistics Center at the Aeronautical Center; and to the branch level in the regional Airway Facilities, Air Traffic, Flight Standards, and Airports; and to all Airway Facilities field offices with a standard distribution.

3. **CANCELLATION.** Order 6950.23A, Cable Loop Systems at Airport Facilities, dated May 23, 1983, is canceled.

4. **BACKGROUND.** Previous revisions, under the National Airspace Systems Plan (NASP), addressed new installations of airport cable loop power systems. This revision refers only to communication cable systems and deletes all references to cable loop systems for power distribution. It supports the cable infrastructure concept for management of cable resources, and encompasses sustained maintenance. It also advocates the upgrade of communication cable services at airport facilities, as defined in the Aviation System Capital Investment Plan (ASCIP) project 46-05, Cable Infrastructure Sustained Support.

5. **EXPLANATION OF CHANGES.**

a. Paragraph 6 has been modified to delete the requirement for cable loop configurations for power distribution systems.

b. Paragraph 7a has been modified to include a requirement for regional planning for cable replacement/upgrade.

c. References to the NASP have been replaced by references to the ASCIP.

d. Paragraph 7e has been added to include a requirement for regional coordination and clearance of all cable replacement/upgrade projects.

Distribution: A-W(AF/AT/FS/SD/PP/AS) -2; A-X(AF/AT/FS/RP/NI) - 3; A-Y(ML)-1; A-Z(AT/CN/FM/AS)-2; FAF-2,3,7(STD)

Initiated By: ANS-600

c. Preliminary cable loop system site surveys shall be conducted by the regions with the support of the National Airspace System Implementation Program (ANI). ANS-600 will determine if a more comprehensive site survey warrants funding.

d. Each region shall determine the airports that are to be candidates for cable loop, or modified cable loop systems. ANS-600 will assign priority to airports that require additional or replacement cable according to the following:

(1) Criticality of a given airport to the safety and security of the NAS.

(2) Condition of underground control/signal cable at said facility.

(3) Systems that would be affected in the event of a catastrophic failure.

(4) Other construction projects ongoing during a planned fiber installation.

(5) Results of a cost benefit analysis determining the feasibility of a fiber install.

(6) Design adherence to the latest edition of FAA Standard 057.

e. At project inception, each region shall be responsible for coordinating all planned cable replacements or new installations associated with facility establishment or relocation, with ANS-600 and the ANI Infrastructure Platform, AN1-30.

f. All affected Integrated Product Teams shall be responsible for furnishing ANS-600 with on-airfield cable requirements that are associated with facility establishment, or replacement, during the critical design review phase.

8. **SYSTEM DESIGN.**

a. In many radially configured communication systems, MAIN and STANDBY service cables were installed in the same trench/conduit, and cable cuts generally resulted in a complete loss of service. CLCS, when implemented in accordance with the latest edition of Order 6650.8, Airport Fiber Optic Design Guidelines, improve circuit reliability by providing path and circuit diversity. CLCS satisfy the path and circuit diversity requirements stipulated in the latest edition of Order 6000.36, Communications Diversity, for air-to-ground remote communication sites and Airport Surveillance Radar (ASR) to Terminal Radar Approach Control (TRACON) networks. Communication networks, where cost-effective, shall consist of CLCS.

b. Where fiber optics is used, design reference shall be made to the latest editions of Order 6650.8, Airport Fiber Optics Design Guidelines, Appendix 1, Network/Node Configuration Standards, Figures A-1 to A-5. The cables shall be installed in underground ducts/conduits. Generally, mid-field fiber splices shall be in above-grade enclosures. Where above-grade enclosures are not practicable, manholes and handholes shall be used. For each airport, the master development or replacement/upgrade plan will provide, where feasible, for the ultimate implementation of a CLCS.

c. Generally, communication media consist of copper coaxial or multi-conductor cables. Transmission media other than copper conductors shall be considered where a new or replacement/upgrade system is planned and it is not practical or cost-effective to utilize existing cabling in the design of the CLCS. Listed below are other transmission media.

(1) Fiber Optic System: Where a new or replacement communication cable system is required, fiber optics should be considered because of exceptional performance characteristics, immunity to lightning-induced surges and noise from power cables (which allows fiber optics and power cables to be installed in the same trench or duct system), and problems associated with variations in signal ground. Where duct capacity is limited, fiber optic cable has significant advantage due to its minimal size. Only ANS-600 approved Programmable Logic Controllers (PLCs), and radio link types shall be approved for implementation in order to maintain supportability and standardization in accordance with FAA policies.

(2) Radio Link: Radio link systems shall be evaluated in lieu of cables where installation of cable may not be feasible, where frequencies are available in accordance with the latest addition of Order 6050.19, Radio Spectrum Management and Use.

9. **FUNDING.** Requests for funding shall be made in accordance with established budget procedures. Funding will be provided in accordance with the guidance provided in Appendix 2. Projects for completing cable loops by filling gaps in existing configurations, or for providing additional capacity for planned growth, are also eligible for inclusion in the Cable Loop Program and/or Cable Infrastructure Sustained Support, ASCIP Project 46-05. Regardless of the source of funding, all proposed fiber optic loop projects shall be approved by ANS-600.

10. **RELATED DOCUMENTS.** The latest editions of the following documents are to be consulted in conjunction with this order.

a. Order 6650.8, Airport Fiber Optics Design Guidelines

b. Order 6950.22, Maintenance of Electrical Power and Control Cables

c. Standard, FAA-STD-057, Airport Fiber Optic Communications Systems Standard

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Figure A-1
RT(R) Network

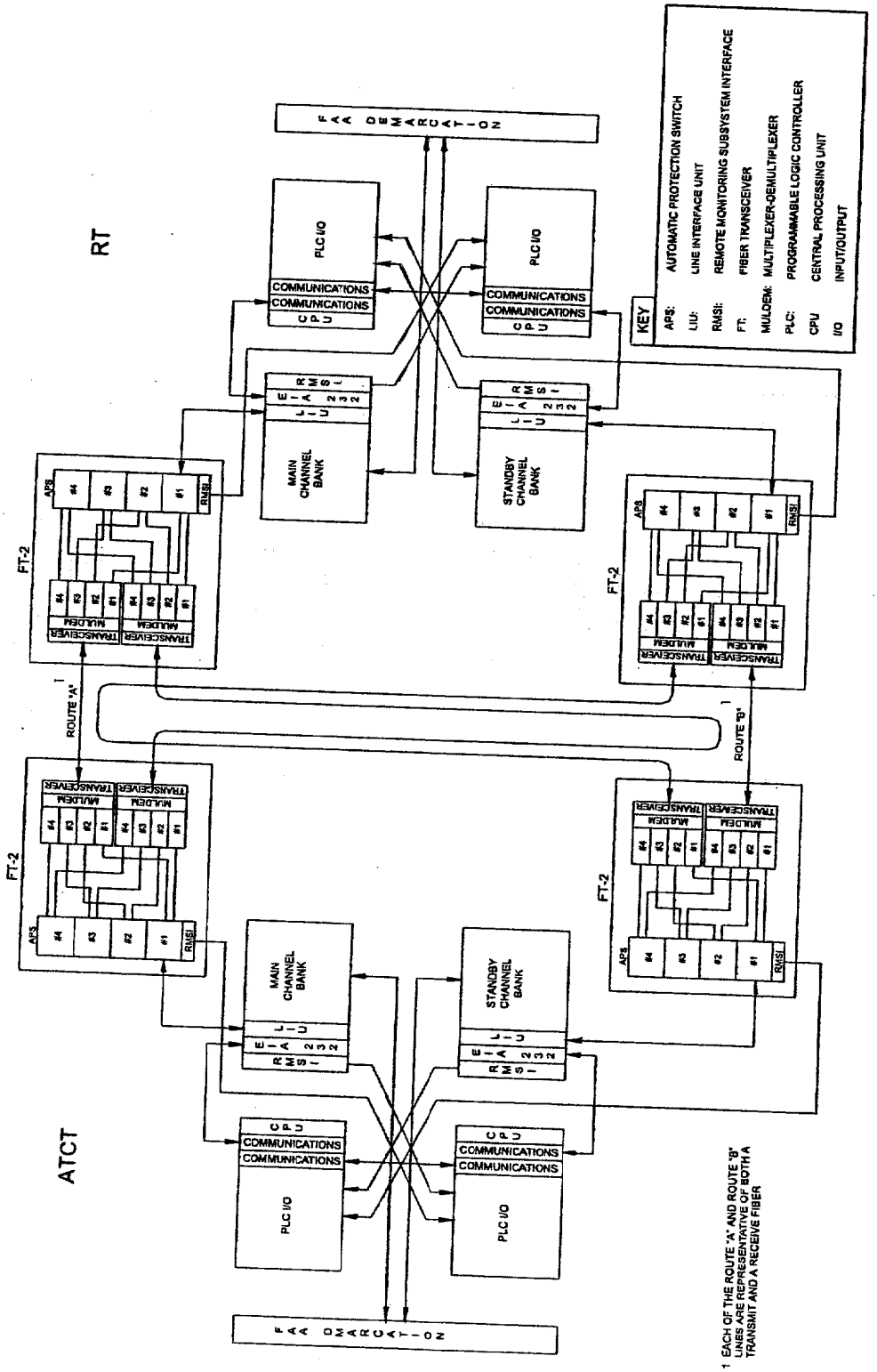


Figure A-2
ASR-9

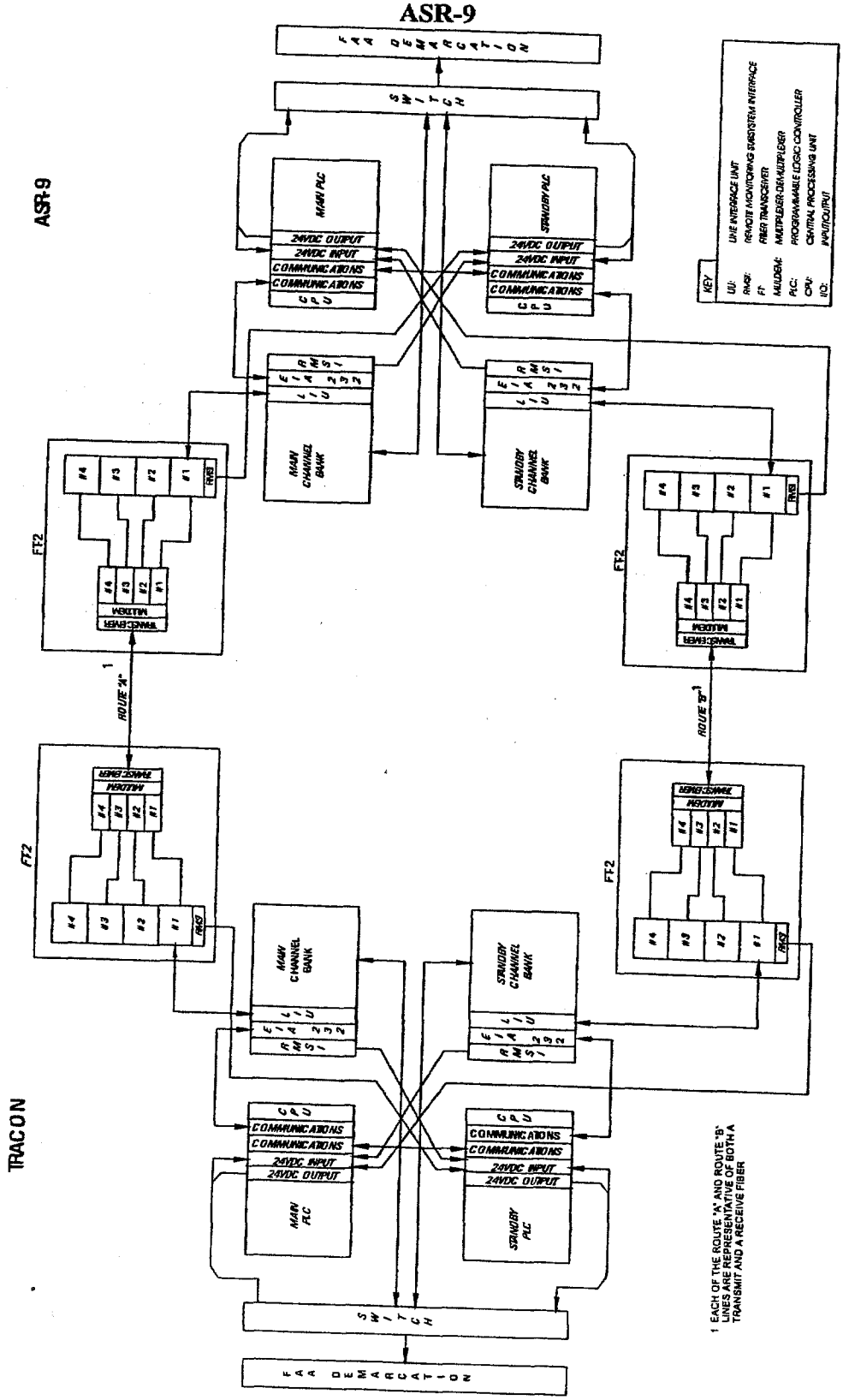


Figure A-3
Facility Node Assignments

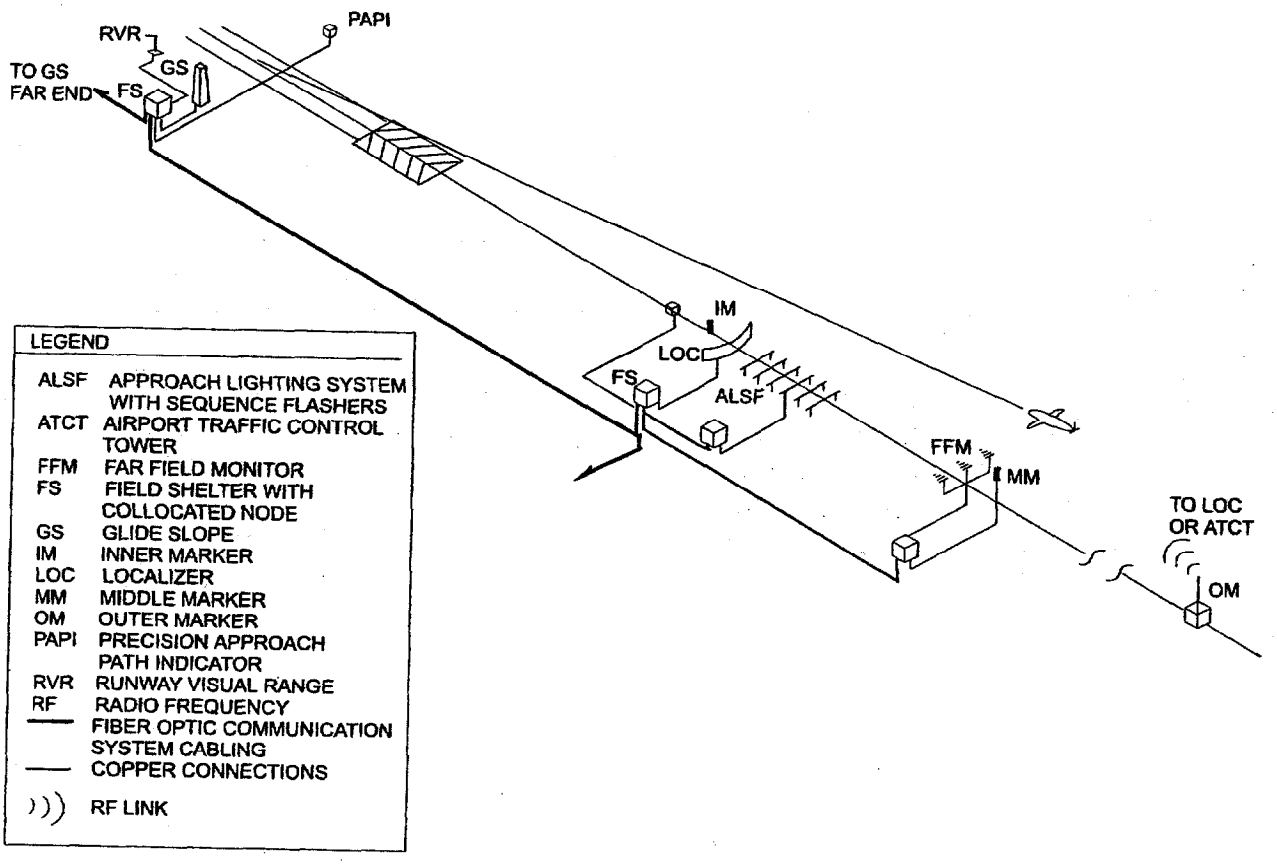


Figure A-4
Runway Network Configuration
Dual Counter-Rotating Rings

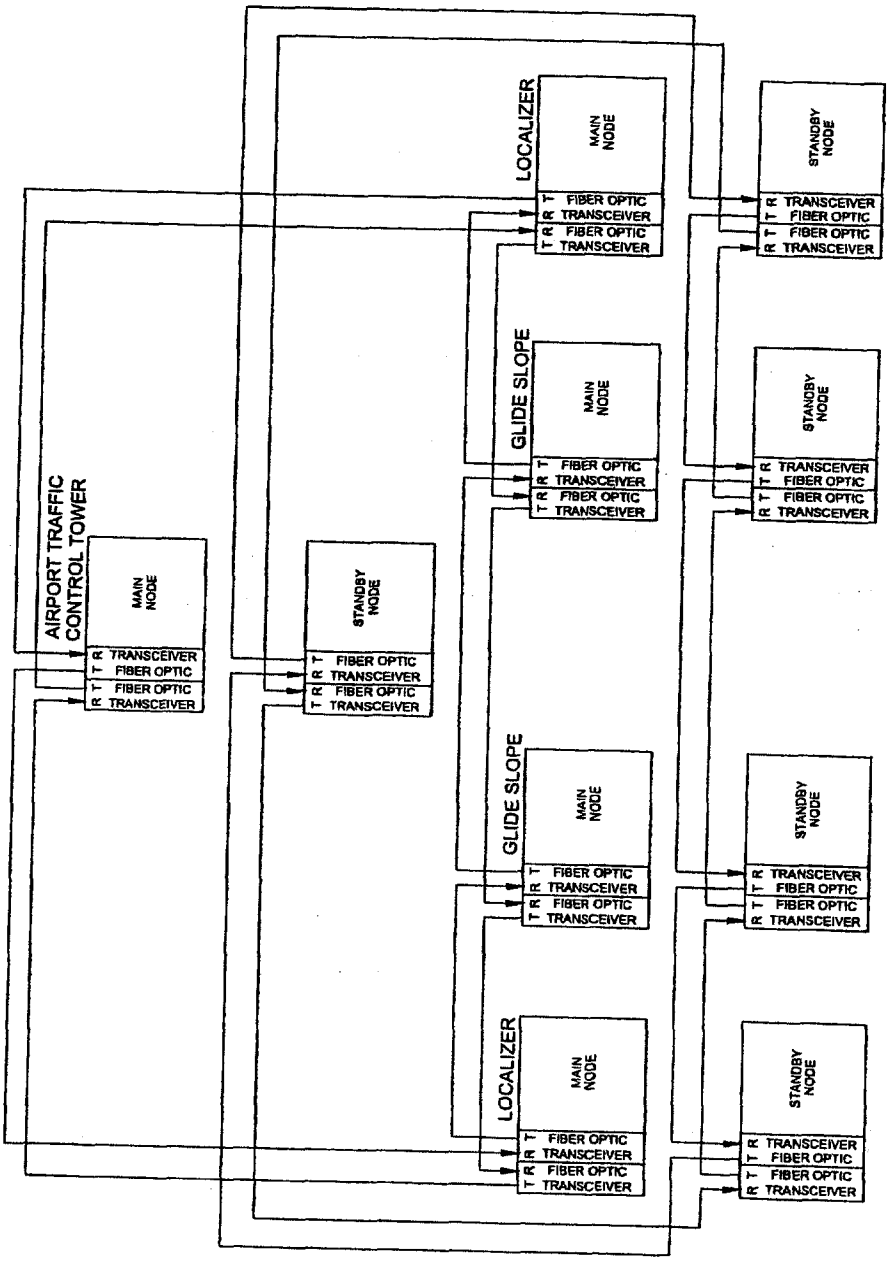
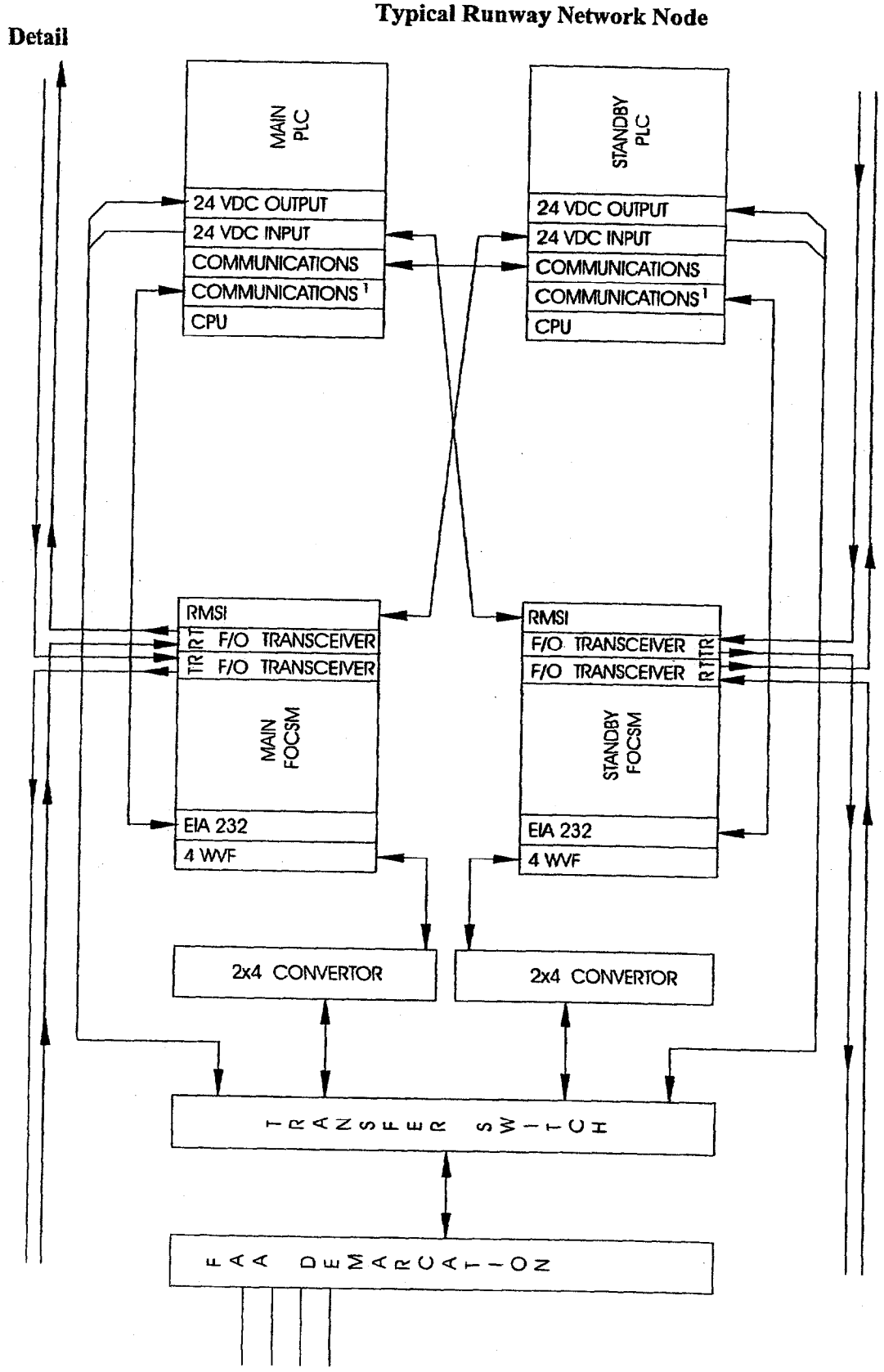


Figure A-5
Typical Runway Network Node



FIBER OPTIC COMMUNICATION SYSTEM MULTIPLEXER
PROGRAMMABLE LOGIC CONTROLLER
REMOTE MONITORING SUBSYSTEM INTERFACE

FOCSM
PLC
RMSI

APPENDIX 2, PRIORITIES FOR FUNDING

1. The funding priorities will be established in accordance with a formula which:

   a. Promotes projects which will have the greatest impact upon NAS operations/availability

   b. Provides an incentive to the regions to acquire all other possible sources of funding and available cable loop related assets.

2. The formula includes three elements:

   a. A factor equal to the Air Traffic Control Grade of the facility

   b. A factor, per Table-1, which reflects the potential impact upon operations of a given airport by assigning a value to the number of facilities to be included in accordance with the FAA standard; and

   c. An element which is an incentive for the regions to secure all other possible sources of funding and cable loop related assets. The incentive is ten times the quantity; where the quantity is two minus the percentage of the total that is to be requested of the Cable Loop Program. The total should include all other sources of funding and cable loop related assets. The funds referred to are those: available to reimburse costs associated with having established or having relocated a facility; available from projects to provide diversity or; provided for cable replacement projects. The assets referred to are, for example, cable-loop-conforming-concrete-encased duct-bank or previously installed cable loop elements depreciated by 5% per year. For the purposes of the analysis, the initial value of concrete encased duct-bank, that is to be credited as an asset, will be limited to $50 per foot.

3. The ranking formula is the product of elements 'a' and 'b' plus element 'c', in other words (A x B) + C.

Table 1	
Facility type	Assigned value
ASR	1.5
RCF MAIN	1.0
RCF STANDBY	1.0
RCF MAIN & STANDBY	2.0
Category I approach	0.5
Category II/III approach	1.0